11010 MATHEMATICS EDUCATION

Institutions will be expected to demonstrate the use of performance assessments within their programs. Examples of such assessments are provided as a guideline with each standard. Institutions are not restricted to using the examples listed, but may develop others that demonstrate candidates' ability to apply what they have learned in the K-12 school setting.

Teachers must have studied the mathematics they could be expected to teach. A high school background of four years of mathematics including the equivalent of pre-calculus is assumed. They also must study mathematics from the next level to help them understand the significance of what they teach for later courses. Teachers should experience mathematics instruction that models the methods they will be expected to be able to use in their own classes. This instruction, designed to actively engage students in higher-level mathematical activities, will include attention to mathematical communication, reasoning, problem solving, connections, and representation.

11010.1 The program requires problem solving and mathematical reasoning. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- design an inquiry based activity to engage students in a constructivist approach to solve a problem.
- identify, teach, and model problem solving in grades 7-12.
- use mathematical representations to solve problems from fields such as natural sciences, social sciences, business, and engineering.
- apply a wide variety of strategies to solve problems and adapt the strategies to new situations.
- organize mathematical thinking to demonstrate understanding of mathematical concepts and processes.

11010.2 The program includes the study of mathematical connections, communication and representation. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- connect mathematics to other disciplines and real-world situations
- use oral and written discourse between teacher and students and among students to develop and extend students' mathematical understanding.
- create and use representations to organize, record, and communicate mathematical ideas.

11010.3 The program requires candidates to demonstrate an understanding of the concepts of school mathematics including algebra and function, number and operation, geometry, statistics, probability, and measurement. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- collect, display, analyze, and interpret data.
- apply numerical computation and estimation techniques and extend them to algebraic expressions.
- model a wide range of phenomena with a variety of functions.
- use geometric concepts and relationships to describe and model mathematical ideas and real-world constructs.

11010.4 The program requires the study of the core mathematics content including calculus, axiomatic geometry, linear and abstract algebra, analysis, statistics, probability and computer programming. The program uses varied performance assessments of students' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- demonstrate understanding of the nature of axiomatic systems by giving proofs in different branches of mathematics.
- use both descriptive and inferential statistics to analyze data, make predictions, and make decisions.
- use algebra to describe patterns, relations, and functions, and to model and solve problems.
- apply the concepts of linear algebra such as matrices and linear programming.
- apply the concepts of limit, continuity, differentiation and integration.

11010.5 The program requires the study of the history and philosophy of mathematics. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- provide a historical context for mathematical ideas.
- provide examples of mathematical contributions by underrepresented groups and diverse cultures.

11010.6 The program requires the appropriate use of technology. It requires the study, selection, and use of concrete materials to help students build understanding of mathematical concepts. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- use computers, calculators, and other instructional technology as tools to solve mathematical problems.
- use a variety of physical and visual materials for exploration and development of mathematical concepts.

11010.7 The program requires the study of a variety of teaching methods and strategies. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- organize and facilitate a variety of instructional modes such as collaborative groups, cooperative learning, and per teaching that are most appropriate for the mathematics content and learners.
- use instructional strategies based on current research as well as national, state, and local standards relating to mathematics instruction.
- deliver or receive electronic instruction such as web-based instruction, electronic textbooks, and interactive video classes.

11010.8 The program requires the study of formative and summative assessment strategies to determine students' understanding of mathematics and to help candidates monitor their own teaching effectiveness. The program uses varied performance assessments of candidates' understanding and abilities to apply that knowledge.

Examples of performance assessments may include how to:

- identify and use appropriate methods for gathering information about student learning
- align assessment with instructional objectives.
- engage in reflective self-assessment and develop a system for self-assessment as a practicing teacher.

History

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